THE RELATIONSHIP BETWEEN MACROECONOMIC VARIABLES AND NON PERFORMING LOAN: EVIDENCE FROM SELECTED ASEAN COUNTRIES

NOOR AZEAN AZDZILA BINTI ZULKIFLI

MASTER OF SCIENCE (BANKING)

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BY:

NOOR AZEAN AZDZILA BINTI ZULKIFLI

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Nama Penyelia (Name of Supervisor) : **Dr. Sabri Nayan**

Tandatangan (Signature) :

Dr. Sabri Nayan
Senior Lecturer
School of Economics, Finance and Banking (SEFB)
038 Economic Building College of Business
Universiti Utara Malaysia
06010 Sintok, Kedah Darul Aman
MALAYSIA

Tarikh (Date) : **22 May 2017**

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ABSTRACT

High non-performing loans (NPLs) create the problem for the banking sector as financial intermediary and signal of banking crisis. Many attempts have been made to investigate the determinant of NPLs yet the crucial issue has remained unexplained. The motivation of this research paper is to study the relationship between macroeconomic variables and global financial crisis on NPLs in the Association of Southeast Asian Nations (ASEAN) countries. Using panel data of 6 countries of the ASEAN for 2005-2015, the model of NPL is regressed using Generalized Method of Moment (GMM) method. Based on the empirical finding reveals that the inflation, gross domestic product (GDP) and global financial crisis significantly effect NPL. In the area of policy implications, the policymaker should focus and reengineering the institutions together with these indicators could reduce the probability of NPLs in bank of ASEAN countries.

Keyword: *Non-performing loan, ASEAN countries, macroeconomic variables, GMM, panel data*

ABSTRAK

Pinjaman tidak berbayar yang tinggi boleh mewujudkan masalah kepada sector perbankan sebagai perantara kewangan serta isyarat kepada krisis kewangan. Banyak kajian telah dibuat untuk mengkaji penentu pinjaman tidak berbayar namun ia masih belum dapat dijelaskan. Motivasi kertas penyelidikan ini adalah untuk mengkaji hubungan antara pembolehubah makroekonomi dan krisis kewangan dunia ke atas pinjaman tidak berbayar di negara-negara *ASEAN*. Dengan menggunakan *panel data*, enam negara *ASEAN* dianalisis menggunakan teknik *Generalized Method of Moment* (GMM) bagi tahun 2005-2015. Hasil kajian menunjukkan bahawa inflasi, keluaran dalam negara kasar (KDNK) dan krisis kewangan dunia mempunyai hubungan yang signifikan terhadap pinjaman tidak berbayar. Dalam bidang implikasi dasar, penggubal dasar perlu memberi fokus dan membina semula institusi bersama-sama dengan indikator ini boleh mengurangkan kebarangkalian pinjaman tidak berbayar terhadap bank- bank di negara *ASEAN*.

Keyword: *pinjaman tidak berbayar, negara-negara ASEAN, pembolehubah makroekonomi, GMM, data panel*

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LIST OF ABBREVIATIONS

ASEAN	Association of Southeast Asian Nations
CESEE	Central, Eastern and South Eastern Europe
CPI	Consumer Price Index
DCRISIS	Global Financial Crisis as dummy variable
FE	Fixed Effect Model
GDP	Gross domestic product
GMM	Generalized Method of Moment
IMF	International Monetary Fund
NPA	Non-Performing Asset
NPL	Non-Performing Loan
POLS	Panel Ordinary Lease Square
RE	Random Effect Model

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter provides a brief discussion on the non-performing loan and macroeconomic variables. The chapter begins with the discussion about the background of the study and followed by the problem statement in section 1.4. Then, explanation about the research questions in section 1.5 and in section 1.6 explains the objectives of the study. While, section 1.7 discusses scope of the study and section 1.8 explains the contribution of the study. The organization of the study is discussed in section 1.9. Lastly, the conclusion of this chapter is explained in section 1.10.

1.2 Introduction of Non-Performing Loan

Bank lending is executed as a complex process, centered on the fundamental principles of credit, assuming, firstly and objectively, the responsibility of repaying the borrowed money amounts and paying the related interest by the borrower in favor of the creditor banks. The significance of a strong and healthy banking sector to a country's economic growth and development is well-established in literature (Adekunle, Salami and Oluseyi, 2013). The effective banking systems help countries to grow, partly by widening access to external finance and channeling resources to the helping sectors (Mugume, 2007). They can do so, if banks create the necessary income to cover their

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APPENDIX

APPENDIX 1

REVIEW OF RELATED LITERATURE

No	Author (Year)	Country/ Data Frequency	Variable used	Model/ Method of Estimation	Finding
1	Gabeshi (2017)	Albania/ Quantitative/ Time series	DV: NPL IV: GDP, Inflation and exchange rate (Euro/Lek)	OLS	The result show that increase in inflation, exchange rate (Eur/Lek), will increase the NPL ratio and an increase in GDP will decrease the NPL ratio.
2	Hajja, et al. (2017)	Malaysia/ Quantitative/ Time series	DV: NPL IV: GDP growth, lending interest rate, inflation and money supply	GMM and vector auto regression (VAR)	The result shows that GDP growth, lending interest rate and money supply has positive relationship with NPL. Meanwhile for inflation there is negative relationship between NPL.
3	Idris and Nayan (2016)	Organization of the Petroleum Exporting Countries (OPEC)/ Quantitative/ Panel Data	DV: NPL IV: oil price volatility, environmental risk, real GDP, inflation, lending interest rate and unemployment rate	Fixed Effect	The results indicated a statistically significant inverse relationship between oil price volatility, GDP and NPLs whereas the relationship is statistically positive between environmental risks, unemployment and NPLs. Meanwhile for inflation and lending interest rate are not significant.
4	Ghosh (2015)	US States / Quantitative/ Time series	DV: NPL IV: Real GDP, state housing	Fixed effects and GMM	The findings show that higher state real GDP and real

			price index, inflation, unemployment rates, and US public debt		personal income growth rates, and changes in state housing price index reduce NPLs, while inflation, state unemployment rates, and US public debt significantly increase NPLs.
5	Abid et al (2014)	Tunisia/ Quantitative/ Time series	DV: NPL IV: GDP, inflation, interest rates	GMM	The findings show that macroeconomic variables, precisely the real GDP growth rate, inflation rate and the real lending rate have an effect on the level of NPLs.
6	Makri et al. (2014)	Eurozone countries/ Quantitative/ Panel Data	DV: NPL IV: growth GDP, public debt of gross domestic product, unemployment	GMM	The findings reveal strong correlations between NPL and various macroeconomic (public debt, unemployment, growth rate of GDP)
7	Castro (2013)	Greece, Ireland, Portugal, Spain and Italy (GIPSI)/ Quantitative/ Panel data	DV: NPL (credit risk) IV: GDP growth, unemployment rate, share price, interest rate, credit growth, real exchange rate, financial crisis	GMM	The findings show that the credit risk increases when GDP growth and the share price indices decrease and rises when the unemployment rate, interest rate, and credit growth increase; it is also positively affected by an appreciation of the real exchange rate; moreover, a substantial increase in the credit risk during the recent financial crisis

					period.
8	Messai and Jouini (2013)	Italy, Greece, and Spain/ Quantitative/ Panel data	DV: NPL IV: GDP growth, unemployment rate and real interest rate	Fixed effect	The results show that GDP growth has a negative impact on NPLs. The unemployment rate and the real interest rate affect impaired loans positively.
9	Klein (2013)	Central, Eastern and South Eastern Europe (CESEE) / Quantitative/ Panel Data	DV: NPL IV: credit the private sector to-GDP ratio, real GDP growth, unemployment rate, inflation rate	VAR	The result show that NPLs were respond to macroeconomic conditions, such as GDP growth, unemployment, and inflation, the analysis also indicates that there are strong feedback effects from the banking system to the real economy, thus suggesting that the high NPLs that many CESEE countries currently face adversely affect the pace economic recovery.
10	Roziela et al. (2013)	Asian Pacific region /Quantitative/ Panel Data	DV: NPL IV: interest rate, inflation and economic growth (GDP)	Random-effect GLS method	The result shows significant negative effect of inflation rate and GDP on the NPL.

APPENDIX 2

DISCRIPTIVE STATISTISTIC

Variable		Mean	Std. Dev.	Min	Max	Observations	
npl	overall	3.580136	2.621471	.757	14.4	N =	66
	between		1.306226	1.601455	4.958909	n =	6
	within		2.329889	.5062273	13.02123	T =	11
cpi	overall	101.0796	16.96154	59.92583	144.9061	N =	66
	between		1.681033	99.35118	104.213	n =	6
	within		16.8909	56.79252	141.7728	T =	11
lngdp	overall	26.2372	.614342	24.77736	27.54532	N =	66
	between		.5598692	25.46919	27.15594	n =	6
	within		.334942	25.46006	26.75708	T =	11
dcrisis	overall	.1818182	.3886502	0	1	N =	66
	between		3.04e-17	.1818182	.1818182	n =	6
	within		.3886502	0	1	T =	11

APPENDIX 3

RESULT: PANEL ORDINARY LEASE SQUARE

Source	SS	df	MS	Number of obs =	66
Model	92.092923	3	30.697641	F(3, 62) =	5.37
Residual	354.594362	62	5.7192639	Prob > F =	0.0024
Total	446.687285	65	6.87211207	R-squared =	0.2062
				Adj R-squared =	0.1678
				Root MSE =	2.3915

npl	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpi	-.0610672	.0197215	-3.10	0.003	-.1004898	-.0216445
lngdp	-.5110564	.5383959	-0.95	0.346	-1.587294	.5651816
dcrisis	-.7131984	.7757363	-0.92	0.361	-2.263873	.8374764
_cons	23.29115	13.39302	1.74	0.087	-3.481117	50.06341

APPENDIX 4

RESULT: RANDOM EFFECT

```
Random-effects GLS regression                   Number of obs      =         66
Group variable: country                         Number of groups   =          6

R-sq:  within  = 0.5843                         Obs per group: min =         11
       between = 0.0285                                        avg =       11.0
       overall = 0.0678                                        max =         11

                                                Wald chi2(3)       =      42.26
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =     0.0000

------------------------------------------------------------------------------
         npl |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   .0137957   .0227179     0.61   0.544    -.0307305    .0583219
       lngdp |  -4.543519   1.023266    -4.44   0.000    -6.549085   -2.537954
     dcrisis |  -.7534932   .6051549    -1.25   0.213    -1.939575    .4325886
       _cons |   121.5319   25.08645     4.84   0.000     72.36338    170.7005
-------------+----------------------------------------------------------------
     sigma_u |  1.1709538
     sigma_e |  1.3253233
         rho |  .43839569   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

APPENDIX 5

RESULT: FIXED EFFECT

```
Fixed-effects (within) regression               Number of obs      =        66
Group variable: country                         Number of groups   =         6

R-sq:  within  = 0.7163                         Obs per group: min =        11
       between = 0.0333                                        avg =      11.0
       overall = 0.0256                                        max =        11

                                                F(3,57)            =     47.96
corr(u_i, Xb)  = -0.9308                        Prob > F           =    0.0000

------------------------------------------------------------------------------
         npl |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   .1327086   .0221769     5.98   0.000     .0883001    .1771171
       lngdp |  -11.17219   1.118412    -9.99   0.000    -13.41177   -8.932605
     dcrisis |   -.851888   .4302468    -1.98   0.053    -1.713442    .0096665
       _cons |   283.4478   27.36037    10.36   0.000     228.6596     338.236
-------------+----------------------------------------------------------------
     sigma_u |  6.7525684
     sigma_e |  1.3253233
         rho |  .96290716   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(5, 57) =    28.98                 Prob > F = 0.0000
```

APPENDIX 6

RESULT: LM AND HAUSMAN TEST

Lagrangian Multiplier Test

```
        npl[country,t] = Xb + u[country] + e[country,t]

        Estimated results:

                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                     npl |   6.872112       2.621471
                       e |   1.756482       1.325323
                       u |   1.371133       1.170954


        Test:   Var(u) = 0
                                  chibar2(01) =    12.31
                               Prob > chibar2 =   0.0002
```

Hausman Test

```
                    ---- Coefficients ----
             |      (b)           (B)             (b-B)     sqrt(diag(V_b-V_B))
             |       fe            re         Difference          S.E.
-------------+------------------------------------------------------------------
         cpi |    .1327086     .0137957        .1189129               .
       lngdp |   -11.17219    -4.543519       -6.628667        .4514107
     dcrisis |    -.851888    -.7534932       -.0983948               .
------------------------------------------------------------------------------
                  chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =      215.33
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

APPENDIX 7

RESULT: GRANGER CAUSALITY

Pairwise Granger Causality Tests
Date: 04/12/17 Time: 21:41
Sample: 2005 2015
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
INFLATION does not Granger Cause NPL	54	4.46863	0.0165
NPL does not Granger Cause INFLATION		2.16571	0.1255
LNGDP does not Granger Cause NPL	54	1.53953	0.2247
NPL does not Granger Cause LNGDP		2.97110	0.0605
DCRISIS does not Granger Cause NPL	54	0.94261	0.3966
NPL does not Granger Cause DCRISIS		3.34192	0.0436
LNGDP does not Granger Cause INFLATION	54	0.19700	0.8218
INFLATION does not Granger Cause LNGDP		3.88158	0.0272
DCRISIS does not Granger Cause INFLATION	54	10.5477	0.0002
INFLATION does not Granger Cause DCRISIS		6.55074	0.0030
DCRISIS does not Granger Cause LNGDP	54	9.77137	0.0003
LNGDP does not Granger Cause DCRISIS		11.1592	0.0001